GENERAL NOTES

An Introductory Treatise on Dynamical Astronomy[1].—No attempt will be made in this note to present a "review" of Professor Plummer's book; for, in the first place, an adequate review could be written only by a specialist in dynamical astronomy, and, in the second place, such a review would of necessity be too technical in its phrasing to be suited to the pages of these PUBLICATIONS. The note is intended simply to call attention to an excellent book which fills a gap in English astronomical literature. The only other book known to me, which is written in English and which is readily accessible to students, that aims to present a general introduction of the theory of motion under the law of gravitation is Professor Moulton's *An Introduction to Celestial Mechanics*, and in content as well as in form of presentation the two books differ widely.

The first six of the twenty-four chapters of Professor Plummer's book deal with "preliminary matters," the fundamental propositions and relations that lead to the discussion of methods of orbit determination, to which the next five chapters are devoted. In his Preface the author says that the latter section "is in no sense complete and is not intended to replace those works which are entirely devoted to this subject. Otherwise it would have been necessary to describe in detail such admirably effective methods as Professor Leuschner's..." Notwithstanding this explanation, regret must be expressed that these methods have been omitted, for by actual use in the computation of orbits of comets, asteroids and satellites they have proved their great value and wide applicability. On the other hand, it is a pleasure to note that two of the five chapters in this section present an excellent discussion of the theory of orbits of visual and spectroscopic binary star systems.

Seven chapters are devoted to the problems of perturbations, the first one dealing "exclusively with abstract dynamical principles which are subsequently employed." One chapter is given to the restricted problem of three bodies, and two to lunar theory. The three closing chapters treat respectively of precession, nutation and time; libration of the Moon; and formulae of numerical application.

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[1] *An Introductory Treatise on Dynamical Astronomy*, by H. C. Plummer, M. A., Andrews Professor of Astronomy in the University of Dublin and Royal Astronomer of Ireland. Cambridge University Press, 1918. Large 8vo., cl. Price, 18 shillings net.

A somewhat careful reading of the section devoted to orbit determinations shows that the book will appeal primarily to the student of astronomical theory rather than to the practical computer; but Professor Plummer is himself a skillful computer and has succeeded in his effort "to leave no formulae in a shape unsuitable for translation into numbers."

R. G. AITKEN.

Dr. Michel Luizet.—The untimely death on November 20, 1918, of Dr. M. Luizet, assistant astronomer at the Observatory of Lyons, has removed from the field of variable star astronomy one of its most active and successful workers. For many years he has been the leading observer of variable stars in France, and indeed few students in this branch of astronomy anywhere in the world have equalled him in the quantity, quality and continuity of his work. His contributions are to be ranked with those of the leaders in the science, such as Argelander, Schmidt, and E. C. Pickering.

Luizet's work has been accomplished with small telescopes and without the aid of special photometric equipment. Instead of modern photometers and extensive research facilities, his assets have been methodical perseverance and a good appreciation of the problems immediately before him. His variable star observations, begun more than twenty years ago, have been carried on in addition to exacting routine meteorological duties.

Perhaps his singleness of purpose is the chief reason that Luizet's name will endure in the history of variable star observation. My bibliography of his papers contains 115 titles, and all but four of them concern variable stars. He dealt with observation rather than interpretation. Cepheid variables and eclipsing binaries received particular attention from him; and his work on certain stars of the eclipsing type have been of especial value in studies of stellar density. Our knowledge of variable stars has not gone so far that progress can be made only by very exact instruments. Careful visual estimates can still contribute valuable results, not only in determining periods of light variation, but also occasionally, as with Luizet's work, in giving light-curves suitable for orbital analysis—suitable, therefore, for the derivation of the dimensions, luminosities, and densities of the stars themselves.

That the maximum light of an eclipsing star is as important as the minimum, was fully appreciated by Luizet, and more than once

by paying careful attention to all phases of the light variation, he has discovered shallow secondary minima or curved maxima. Fortunately he has had the foresight and endurance to work on difficult eclipsing stars of long period. These objects belong to the redder spectral types and are of low density; knowledge of them contributes, therefore, directly to the problem of the order of the evolution of stars.

We note in concluding that Luizet's work has been mainly of the kind that sustains the proudest tradition of astronomy, that is, the intelligent accumulation of observations, unhampered by preconceptions and unprejudiced by hypotheses. He leaves to others the deduction from his observations of facts relating to the nature of stellar evolution; he little suspected, probably, that his monograph proving the unchanging period of *Delta Cephei* would be of value later in the problem of the age of stars. His task primarily has been to add piece by piece to the sum of knowledge in his chosen branch of science, and that task he has accomplished well.

HARLOW SHAPLEY.

A Note on the Size of the "Hydrogen Envelop Star"—Campbell's[1] hydrogen envelop star, B. D. +30° 3639, according to Wright[2] is a Wolf-Rayet star with a gaseous nebula for an envelop or a planetary nebula with a stellar nucleus. The approximate size of this interesting object may be found from available data.

The apparent diameter of the hydrogen envelop has been determined with the aid of a spectroscope by Campbell visually and by Wright photographically. The values obtained, 5″ and 7″ respectively, agree excellently, considering the difference in the methods employed tending to make the former too small and the latter too large, as pointed out by Wright. For this reason the mean value, 6″, represents the apparent diameter of the hydrogen disk with a higher degree of precision than is mathematically evident.

The parallax of the star was determined theoretically by Gyllenberg.[3] On account of the difficulties involved it is quite remarkable that the distance of such an object should be known even approximately. Several assumptions in the method employed, e. g., that

[1] *Astron. and Astroph.*, **13**, 462, 1894.

[2] *Ap. Jour.*, **40**, 469, 1914.

[3] "The Distribution in Space of Stars of the Spectral Type O," p. 13, 1917. *Arkiv. for Matematik, Astronomi och Fysik*, Band 11, No. 28.

the stars of Class O have equal individual temperatures as well as masses, may be open to question; but the value obtained for the parallax, 0".006, will be accepted for the purpose of this note.

The size of the hydrogen envelop follows directly from the apparent diameter and the parallax, giving 6÷0.006 or 10,000 astronomical units for the true diameter. The radius of the envelop is accordingly about 170 times the distance of *Neptune* from the Sun or 1/55 the distance of the nearest star.

The absolute magnitude of a Class O star according to Gyllenberg is −2.78 at a distance of one Siriometer or 1,000,000 astronomical units. At the distance of the Sun the magnitude would be −32.9. Using −26.5 (Abbot) as the magnitude of the Sun, we find that the star is about 400 times brighter than our luminary.

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On the Rotation of Celestial Bodies.—Messrs. Shinzo Shinjo and Yoshikatsu Watanabe have an interesting paper on this subject in the *Memoirs of the College of Sciences, Kyoto Imperial University* (Vol. III, No. 7, 1918). The paper consists of two parts, (1) a numerical determination of the masses and angular momenta of those binary star systems for which the parallaxes have been measured and for which orbits have been computed or for which "probable values" of the elements needed can be derived with more or less certainty from the observed motions; (2) a theoretical determination of the angular momentum of a swarm of meteorites isolated from external influences and initially in spherical symmetry. In the comparison of the results of the two computations the authors find the basis for their theory that the stellar systems have evolved from primordial swarms of meteorites isolated from one another, the constituent bodies of a swarm being comparable in size with our present asteroids. In the variation in the size of the meteorites (and presumably of the swarm) they find the conditions determining the evolution into single, double or multiple systems. The gaseous nebulae are explicitly excluded.

The data of observation on which these conclusions rest are necessarily of very unequal value. Some of the parallaxes may be regarded as very accurate, others as quite uncertain. This remark applies also to the orbit data, even for those systems for which

orbits are available, and still more to those for which "probable values" of the necessary elements are taken from the observed motion over small arcs. The uncertainties in the parallaxes, as the authors themselves point out, are the more important. Hence, altho they conclude that, "broadly speaking," the masses and angular momenta of the 86 systems are "of about the same order of magnitude," it is not surprising that individual values range from 0.15 ⊙ to 7.45 ⊙ for the masses, and from 0.30 ⊙ to 161 ⊙ for the angular momenta.

Professor Hale and the Royal Astronomical Society. The following paragraph is copied from the department "From an Oxford Note-Book" in *The Observatory* for December, 1918.

> The "second Friday" in November could not, of course, hold a candle (even a war candle) to the second Monday—"The Day" for which Germany has been longing so long—but it was nevertheless notable. The Royal Astronomical Society reassembled under conditions very different from those under which they had last met in June; and they had the pleasure of welcoming Hale, who told them about the 100-inch amid great enthusiasm. The meetings of the Society are followed by a club-dinner of a domestic character; but it would be straining reticence beyond reasonable limits not to mention that at that particular dinner Hale was elected by acclamation an Honorary Member of the Club "any rule or custom to the contrary notwithstanding," the unprecedented election being symbolical of that new union of the United States with England which had found so splendid an expression in war, and which, it is confidently hoped, will develop into a more enduring co-operation in peace. Hale made a great speech on the occasion, but here it will be proper to relapse into privacy—not for fear of the censor, but because some things strike too deep for written words.

Charles William Adams.—We have received from Dr. Charles E. Adams, Government Astronomer of New Zealand, a brief biographical sketch of his father, the late Charles William Adams, who was one of the pioneers in astronomical and geodetic work in New Zealand. Mr. Adams spent forty-two years of his long life in the Survey Department, holding many important positions, and his published papers relate chiefly to subjects in geodesy and general surveying. In later years he was also connected with the Hector Observatory, rendering valuable service as observer for time and as adviser on methods of professional procedure.

The most unusual incident in his astronomical career, however, was his successful challenging of the accuracy of the declination of

α^2 *Centauri*, as recorded in the English *Nautical Almanac* in the 1870's, on the basis of his latitude observations at three stations *with an 8-inch theodolite;* for as his biographer says, "generally speaking, surveyors and sea captains swear by the *Nautical Almanac*. In their opinion the Bible *may* be true, but the *Nautical Almanac must* be true. Sir George Airy, Astronomer Royal at the time, candidly acknowledged the correctness of Mr. Adams's observations.

The Practical Observing of Variable Stars.—We have received from Mr. Charles E. Barns, of Morgan Hill, California, an attractive little pamphlet with the above title which may be recommended without reserve to all members of our society who are interested in the variable stars. The contents, contributed by members of the American Association of variable Star Observers, consist of short papers, original or compiled from standard authorities, every one of which is of practical value to the amateur observer. A list of variables taken from *H. C. O. Circular 166*, and a list of atlases and books of reference add to the usefulness of the booklet. Mr. Barns generously offers to forward copies to any members of the Astronomical Society of the Pacific who wish to engage in the study of variable stars.

Recent Medal and Prize Awards.—The Royal Society of London has awarded a Royal Medal to Professor Alfred Fowler for his researches in spectroscopy, and, in particular, for his extraordinary success in the identification and reproduction of celestial spectra in the laboratory.

The French Academy of Sciences has awarded the Prix Lalande to M. A. Belopolosky of the Poulkovo Observatory, Russia, for his work in astronomical spectroscopy; the Prix Valz to M. Frédéric Sy of the Algiers Observatory for meridian circle and photographic observations during the past thirty years; and the Prix Janssen to Father Stanislas Chevalier of the Zô-Sè Observatory, Shong-Haï, for services to astronomy and especially for his solar studies.